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Response to Gary Jones 2002. "Impacts of grazing"

Impacts of Grazing on Semiarid Rangelands

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Gary Jones (2002) criticizes the model of rangeland dynamics on the grounds that it assumes a negative impact of livestock on grasses and does not assume that livestock damages woody plants. He cites the writings of Voisin (unreferenced) and others as evidence that grazing stimulates grass growth. Experimental evidence on the stimulation of grasses by grazing is not common, although we acknowledge that it exists. Some of the best hard evidence for compensatory growth by grasses following defoliation comes from the work of McNaughton (1985) and colleagues in the Serengeti. Although some work was reported on the effects of herbivore saliva as a stimulant for grass growth (e.g., Dyer 1980), research on this effect has not been replicated and has largely fallen by the wayside.

We do not disagree that, under conditions of light grazing in a pattern that involves periods of grazing separated by periods of rest, some (grazing-adapted) perennial grass species exhibit compensatory growth and even overcompensation in a few instances (i.e., increased growth relative to no defoliation). Coughenour et al. (1984) summarize these effects in a simulation study. However, all studies show (and Jones does apparently recognize this) that, under conditions of continuous heavy grazing, grass growth is decreased to the point of mortality under extreme conditions. This is especially so in the semiarid rangelands. We do not agree with Jones' observation that animals impede the survival of trees. We are not considering forests vs. grasslands; we are considering semiarid savanna rangelands that are being grazed by domestic livestock that either exclusively or preferentially eat grass. The grazing regimes vary and, except in a few cases, involve continuous and mostly heavy grazing. The empirical evidence for the negative effects of this kind of grazing on grass and, in the absence of fire, the consequent emergence of dense thickets of woody plants is overwhelming. There are millions of hectares of such rangeland in Australia, Africa, and the Americas. Bush encroachment by woody weeds that are called different names in different countries is not a figment of the collective imagination. It is a very real, extensive, and serious problem, and it is that problem that we have addressed in our model. The ecological underpinning for it is given in many refereed papers in a variety of journals. For those who need convincing, it might be sufficient to take a look at three books: Ludwig et al. (1997), Scholes and Walker (1993), and Noble (1997).

We agree with Jones that it is important to ensure that the models from which theoretical implications are drawn are sound and that their assumptions are clear. The model we have presented, which was designed to address the problem of woody plant invasion in semiarid rangelands, has a strong empirical base, including the physiological response of the grasses to grazing and the responses of grasses and woody plants to fire. We have to disagree with Jones' suggestion that the widespread conversion of mixed shrub-grass, semiarid rangelands to shrub-dominated systems with an insignificant grass layer is not a general case and is not due to the effects of grazing and the elimination of fire. A more thorough treatment of these effects, including the conditions under which the change to a woody state occurs, is given in Anderies et al. (2002). This analysis includes the reciprocal dynamics of the leaf and the crown/root components of grasses under increasing levels of defoliation, and substantially agrees with the results of the model to which Jones objects.

RESPONSES TO THIS ARTICLE

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